(19) Europäisches Patentamt
European Patent Office
Office européen des brevets

(11) EP 0 875 618 A2

(12) EUROPEAN PATENT APPLICATION

(43) Date of publication:
04.11.1998 Bulletin 1998/45

(51) Int. Cl.6: **D06N 7/00**, D06N 3/00

(21) Application number: 98106875.2

(22) Date of filing: 16.04.1998

(84) Designated Contracting States:
AT BE CH CY DE DK ES FI FR GB GR IE IT LI LU MC NL PT SE
Designated Extension States:
AL LT LV MK RO SI

(30) Priority: 16.04.1997 IT BG970019

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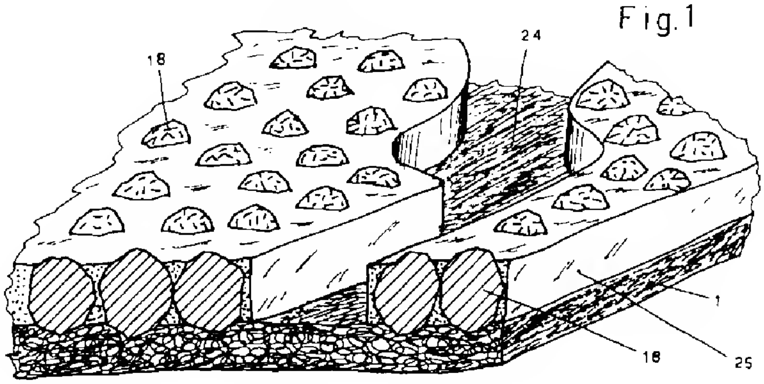
(54) Method for the continuous production of sheets for wall coverings with attachment backing made of non-woven fibreglass fabric and sheets produced

(57) This method for the continuous production of sheets for wall coverings has the distinguishing feature that it uses a non-woven backing of fibreglass printed with ornamental designs of any kind by rotary screen printing of an adhesive, preferably an acrylic adhesive, capable of incorporating hard particles, such as sand, poured onto it uniformly in controllable quantities, when the area of backing to which it has been applied is about to pass around a low roll in a 180° turn, thereby forming a V-shaped recess for collecting the falling hard particles and forcibly embedding them by the contact pressure of the non-woven backing on the semicylindrical surface of the turn roll, while hard particles lying on areas of the non-woven that are not covered with the printable adhesive are removed by suction and subsequent blowing before the processed sheet passes into an oven for drying of the abovementioned adhesive.

Fig.1



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Description

This invention relates to a method for the continuous production of sheets for wall coverings with an attachment backing made of non-woven fibreglass fabric, and also to the sheets produced by the said method. As is known, the walls of domestic dwellings are often decorated with smooth plaster, or with paint or wallpapers. The decoration of vertical walls raises many problems depending on the various ways it is carried out. These problems can be group in two fundamental categories:

- the category of ecological problems;
- the category of functional problems.

With regard to the ecological problems connected with current methods of decorating walls, the most serious are those to do with the use of conventional wallpapers, as these have a structure ot polyvinyl chloride-based plastics materials. This material is well known as a potential carcinogenic factor, raising problems in both the production environment and in the environment in which it is dumped after being removed for replacement. This kind of plastic covering, like other very common plastic coverings with a polyurethane structure, also has the drawback of being highly impermeable, so that, by its retention of the moisture of the domestic environment on itself, it prevents the wall from "breathing" in the natural and healthy way. This impermeability is furthermore the cause of local detachment along the join lines between the sheets, the moisture in the walls attempting to tind a way out and managing to do so where this is easiest. Also very popular are fibreglass fabrics used for sticking to walls. The problem with the use of these glass tabrics is the dangers created in the environments where the glass is made into a fabric, by reason of the microscopic fibres released into the air. During the fabric-making process, what happens is that the glass fibres come under much stress and rubbing resulting in the formation of microfibres suspended in the air. Fibreglass fabric also has the disadvantage of not being "strippable", i.e. it cannot easily be removed from the wall, partly because the fabric is so tough and partly because of the powerful adhesion offered to the adhesives by the square holes of the weave. As far as technical problems are concerned the present trend for the familiar smoothing of walls to be abandoned in favour of sticking them with a covering designed to be painted, as if it were itself a wall, must be considered.

Normal coverings of this type have also, besides the advantages that have justified their use, major drawbacks, of which the following may be cited. Where these coverings are of the very common fibreglass fabric type, there is the drawback that two successive coats of paint are necessary because of their surface roughness. These coats of paint, moreover, can only be applied once the adhesive with which the fabric has been hung on the walls has completely dried, as otherwise the porosity of their warp-weft structure will allow the adhesive to permeate back onto the visible surface. Coverings of fibreglass fabric are aesthetically unsatisfactory because they can give the applied paint a simply monochromatic appearance, due to the uniformity ot the fabric surface. Even what ornamental designs are possible are very limited owing to the much greater difficulty of weaving glass than of weaving normal yarns. All currently known wall-covering sheets are very delicate, tearable and have poor resistance to rubbing, owing to their surface having the weak cohesion of rubbery plastics such as the vinyls and the polyurethanes. The generality of coverings are in any case very thin in order to keep costs down to compete on the market; this fact has the drawback that irregularities on the surfaces ot the walls on which these coverings are hung cannot be hidden; it also leads to the formation of blisters, which may be the consequence either of inexpert work by the painter or the internal moisture of the walls. It is an object of the present invention to devise a method for the continuous production of sheets for wall coverings involving the use of materials capable ot giving the sheets special qualities not possessed by currently known sheets. Another object is to devise a method, as above, of producing sheets for coverings using very hard materials tor the surface. Another object is to devise a method, as above, of effecting an association of the said hard materials with binders having sufficient elasticity to allow the sheets to be wound into rolls. Another object is to devise a method, as above, of producing sheets with their visible surface decorated with designs of any shape. Another object is to devise a method of producing painted sheets. Another object is to devise a method of producing sheets for wall coverings that can have decorations in relief. Another object is to devise a method of producing sheets for wall coverings with different visible structures such as to present differing capacities to absorb paint and create bitonal chromatic effects from a single coloration. These other objects will be seen to have been achieved upon reading the following detailed description explaining the concise account given in the accompanying claims. The invention is illustrated, purely by way of non-restrictive example, in the appended sheets of drawings in which:

- Fig. 1 shows a greatly enlarged view in section ot an area of a wall-covering sheet produced by the method described;
- Fig. 2 shows a greatly enlarged view of an example showing the compressed deposition of adhesive performed on the non-woven fabric by rotary screen printing; and
- Fig. 3 schematically shows the paths followed by a non-woven backing made of fibreglass in which the backing is screen-printed with the adhesive and the granules of hard material are stuck to the adhesive.

Referring to the abovementioned Fig. 3, a continuous non-woven backing made of fibreglass 1, traveling around ordinary turn rolls 2, 3, 4, arrives underneath a screen printing cylinder 6. The backing is preferably MICROLITH-FF-125/2-B6 sold by Schuller Company and has a thickness of approximately 0.7 mm. However, equally good results suitable for specific requirements could also be obtained with backings having a weight per unit area of between 100 and 150 g/m^2.

In order to enable the said backing to perform its covering role effectively it is "opacified", by known means, prior to its printing. The term "opacified" is used in the industry to indicate an optical whitening treatment in which the backing is spread with an ordinary mixture of acrylic resin and titanium dioxide. With this opacifying primer the covering is able to conceal even large differences of chromatic tonality, to such an extent that even a single coat of paint will be found sufficient as a finishing for the covered wall. As in the prior art, a tube 7 is mounted inside the said printing cylinder 6 to supply the adhesive for printing; the said adhesive emerges uniformly along the entire length of the tube 7 in order to offer to a fixed squeegee 8 an amount suitable for spreading on the densely perforated inside surface of the printing cylinder 6 as the cylinder rotates 9. Thin discs 10A (Fig. 2) of adhesive 25 are extruded from these minuscule holes and deposited on the surface of the non-woven backing. The said backing is traveling in a direction 11 with a speed equal to the peripheral speed of a back pressure drum 5, in contact with the surface of the printing cylinder 6 through the interposed backing 1. The said discs 10A, after undergoing compression, then tend to expand and join together along their short contacting generatrices. This joining together will be more complete the more liquid the adhesive 25 of which they are composed; however, the more completely they join together the more the printed adhesive will form a continuous and impermeable film, which would nullify the desired porosity or breathability of the resulting printed sheet. To prevent this from happening, the adhesive must possess a viscosity such that the abovementioned joining together is incomplete on a microscopic level so that pinholes 28 are left through which the normal moisture found in walls can breathe. This must continue to be the case even following the compressions to which the adhesive, initially in the form of discs 10A, will be subjected in the subsequent processing phases by many turn rolls 12, 13. As a guide, the adhesive 25 has a dynamic viscosity measured with a Mettler RM180 Rheomat instrument of between 0.93 and 1.80 Pa.s at a temperature of 25.5°C and with a shear gradient of 200 1/s using the "33" measuring system. After receiving the adhesive in shapes representing a desired printed design 14 which includes areas 24 of the non-woven backing that are visible, the non-woven backing arrives at a turn roll 15 that deflects it downwards, where it passes around the roll 12, turning through an arc of approximately 180° before traveling back up towards another turn roll 16 from which it passes on to a further roll 17 which guides it towards an ordinary drying oven (not drawn), after an ordinary blower 26 has first removed any residual particles that have not stuck to the adhesive. By following this path the backing 1 exposes its freshly printed surface 1A to a shower of hard particles 18 dropped through a slot 19 in the bottom of a hopper 20. The width of this slot is adjustable automatically or manually to suit the forward speed of the fabric, that is to say so as to release the optimum quantity of particles. Most of these particles however fall onto the roll 12 which, since it is rotating in a direction 21, transfers them onto the said printed surface 1A, into which they sink under the pressure of the same roll 12 through an arc of approximately 180°. The passage around the roll 12 has the advantage that it enables less fluid adhesives to be used, thus promoting the formation of the abovementioned microholes 11 and reducing the possibility of its working its way through the thickness of the non-woven backing 1. Indeed, were the adhesive to permeate through the backing there would be major production problems as the adhesive would come into contact with the turn rolls 22, 15, 12, 16, 17 and foul them, which would quickly degrade their operation. The abovementioned solution of forced "squeezing" of the hard particles 18 into the relatively viscous adhesive 25 avoids the dangerous alternative necessity of entrusting the adhesion of the particles to the fluidity of the adhesive 25. The ratio of the thickness of the adhesive screen-printed onto the backing 1 to the general diameter of the hard granules or particles is approximately 0.85:1. In other words about 15% of each particle 18 projects above the surface of the adhesive.

This has the advantage of giving the sheet 23 (according to the invention) a visible surface largely composed of hard material which is therefore well able to offer great resistance to rubbing, especially as most of the volume of the particles is buried in an adhesive 25 which, once dry, is very tough. The fact that the top surface of the sheet 23 is largely composed of hard material is due, obviously, in part to the uniformity and density with which the particles 18 are laid on the backing 1, and indeed they lie side by side in contact with each other, occupying as much as possible of the surface to which they are bonded. The achievement of maximum density, and in consequence of uniformity, is the result of using a shower of particles 18 in slight excess, i.e. above the capacity of the adhesive to capture it all upon itself. The problem of this excess is then eliminated by the present method by providing underneath a trough 27 with powerful suction means operating at its sides to collect all the particles that have not stuck to the adhesive and return them to the hopper 20 in accordance with known methods. The ideal particles 18 for this invention are grains of sand, i.e. of quartz with a diameter of approximately 0.2 mm, but this does not rule out the use of particles of some other material hav-

ing a hardness satisfactory for the purpose. The non-woven fabric suggested as preferred in the said method is of the type made up of short glass fibres laid in perpendicular layers. While from certain points of view to do with the properties of the finished product the nature of a non-woven fabric offers undoubted advantages, nonetheless in other respects to do with its simple structure it could present the drawback that its fibres are poorly bonded together and therefore liable to be lost, that is, to be rubbed or pulled out by the very printing cylinders themselves, which as a result would no longer be able to operate properly. Before the non-woven fibreglass fabric is used, it is put through a preparatory impregnation with an acrylic resin modified by a well-known technique. This is in order to compact the non-woven so as to make it able to withstand the tearing compression exerted by the hard surface particles and so prevent the escape of microfibres into the air, increase its tensile strength and enhance its strippability. In the present method a fundamental role is played by the interdependence of many parameters because the importance of any one of them involves the characteristics of others. One example of this is the choice of the "clothing" of the printing cylinder, i.e. of the usual densely perforated cylinder made in thin nickel-chromium steel sheet that is used to create the printing matrix. This clothing is usually treated with photosensitive gelatins spread by a special axially moving ring and treated by familiar techniques so as to leave certain perforated areas open, through which the squeegee can squeeze the printable adhesive 25, and to block other areas through which no adhesive is to pass; the shape of this area defines the shape 14 deposited or printed on the backing. The quantity of adhesive deposited represents a point of equilibrium between multiple factors connected with the intrinsic properties of the printable adhesive, the mechanical strength of the squeegee, the mechanical strength of the perforated plate, the thickness of this plate (because the greater the thickness the holes pass through, the more adhesive they can hold and release), and the thickness of the covering on the outside of the clothing formed by the gelatins which then set into a very hard resin.

The thickness of the outer covering affects the distance between the clothing and the surface to be printed with the adhesive 25 pressed by the squeegee 8 and variously absorbed by adhesion by the printable surface of the backing 1 owing to the action of the back pressure drum 15. One practical example that offers an equilibrium between the factors cited, and enables the method to be carried out satisfactorily, employs nickel-chromium clothings having a thickness of 210 microns and a 100 "mesh" perforation. It also uses two layers of masking gelatin (for creating the design 14 to be printed) so as to give "non-inking" thicknesses on the outside of the clothings that are very great and compatible with the relatively high density of the adhesive 25. The said adhesive is preferably of acrylic type (e.g. that known by the trade mark ACRONAL 290 D from BASF), but the method can also be carried out with other adhesives, such as vinyl type adhesives. The high viscosity of the printable adhesive, necessary for the implementation of the method, creates the manufacturing problem of a gradual accumulation of the adhesive at the open ends of the clothing (i.e. of the printing cylinder 6): such an accumulation creates "rings" of adhesive which ooze out at the sides and can be picked up simply by the movements of parts around the outside of the clothing. This would cause the rings to become flattened onto the backing 1, which would thereby be soiled - in other words continuously ruined, causing immense damage. The method provides for the elimination of this potential event by employing two dedicated suction pumps, preferably of the diaphragm type; these pumps are positioned at the two open ends of the clothing and close to the two ends of the squeegee 8 in order to remove the adhesive that would tend to ooze out of the said printing cylinder or clothing. The resulting product has the advantage of being thick, semirigid and composed primarily of mineral substances. In addition it is suitable for hanging definitively while yet being easy to remove (strippable) when required. Since its surface is made with different materials and porosities (1, 24; 25, 18) it has the advantage that bitonal chromatic effects can be obtained with a single coat of paint.

Claims

1. Method for the continuous production of sheets (23) for wall coverings, characterized in that it uses a non-woven backing (1) of fibreglass preferably with an opacifying primer printed with ornamental designs of any kind (14) by rotary screen printing of an adhesive (25), preferably an acrylic adhesive, capable of incorporating hard particles, such as sand, poured onto it uniformly in controllable quantities (19), when the area of backing to which it has been applied is about to pass around a low roll (12) in a 180° turn, thereby forming a recess for collecting the falling hard particles and forcibly embedding them by the contact pressure of the non-woven backing on the semicylindrical surface of the turn roll (12), while hard particles (18) lying on areas of the non-woven that are not covered with the printable adhesive (25) are removed by suction and subsequent blowing (26) before the processed sheet (23) passes into an oven for drying of the abovementioned adhesive.

2. Method according to the previous claim, characterized in that it employs a nickel-chromium clothing or printing cylinder (6) having, as a guide, a thickness of 210 microns and a 100 mesh perforation, the said clothing being treated with two layers of gelatin, the second layer of gelatin, which may for example contain epoxide, being spread on the already-

hardened first layer in an axial movement in the opposite direction to that in which the first layer was applied, in order to render the thickness more uniform.

3. Method according to the previous claims, characterized by a long rectangular tank (27), for collecting excess particles (18) falling onto the pressing roll (12), being placed below the latter roll and extending beyond its ends, in order to collect particles that have not remained attached to the adhesive (25) and allow two suction nozzles located at the ends of this tank to carry them away (18) and return them to a hopper (20) for reuse.

4. Method according to the previous claims, characterized by striking the surface of the sheet (23), already provided with the hard particles (18), with a jet of blown air (26) capable of removing weakly attached particles before the sheet enters the adhesive-drying oven.

5. Method according to the previous claims, characterized by a printing roll or clothing (6) equipped at its open ends, in a suitable position at the bottom of the sides of the squeegee (8), with suction inlets for a positive-displacement pump, preferably of diaphragm type, for removing the adhesive (25) as it collects at each end of the squeegee, in order to prevent it from oozing out at the sides and reaching and so damaging the front surface on contact with the non-woven backing (1) that is being printed.

6. Method according to the previous claims, characterized by a process of screen printing performed with an equilibrium between the viscosity of the adhesive (25), the printing contact pressure (5, 6), the adhesion to the backing (1), the size of the holes of the clothing, the thickness of the clothing and the thickness of the masking gelatin, which is such as to allow deposition of the adhesive (25) forming pinholes (28) between the extruded discs (10A) of adhesive even after deposition (19) and compression (12) of the particles (18), in order to give the final sheet (23) an appropriate permeability or breathability.

7. Method according to the previous claims, characterized by a layer of adhesive (25) whose thickness is such that, after the particles (18) have been pressed in, their tops project from it by approximately 15% of their general diameter (Fig. 1).

8. Sheets for wall coverings produced by the method according to the previous claims, characterized in that its base structure is a non-woven backing (1) of fibreglass printed for ornamental purposes (14) by a rotary screen printing method using an adhesive (25) subject to hardening for the incorporation and fixing of hard particles (18), such as siliceous sand, projecting from the level of the adhesive attaching it to the non-woven (1), which ornamental print includes large areas (24) without adhesive that are therefore capable of permitting great permeability or breathability.

9. Sheets according to Claim 8, characterized by the structure of a non-woven fibreglass fabric preimpregnated with an opacifying primer, said primer preferably consisting of a compound based on acrylic resin and titanium dioxide.

Fig.1

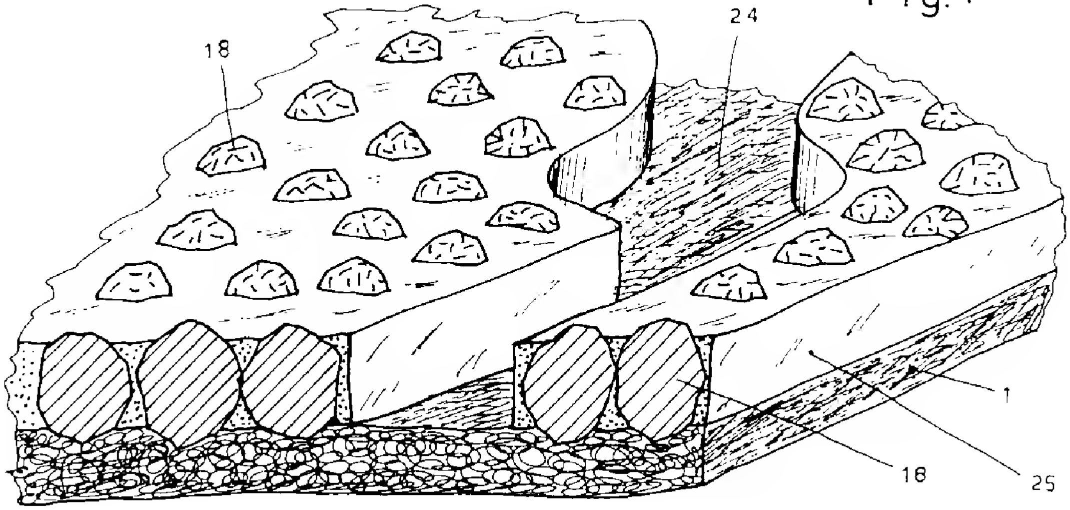
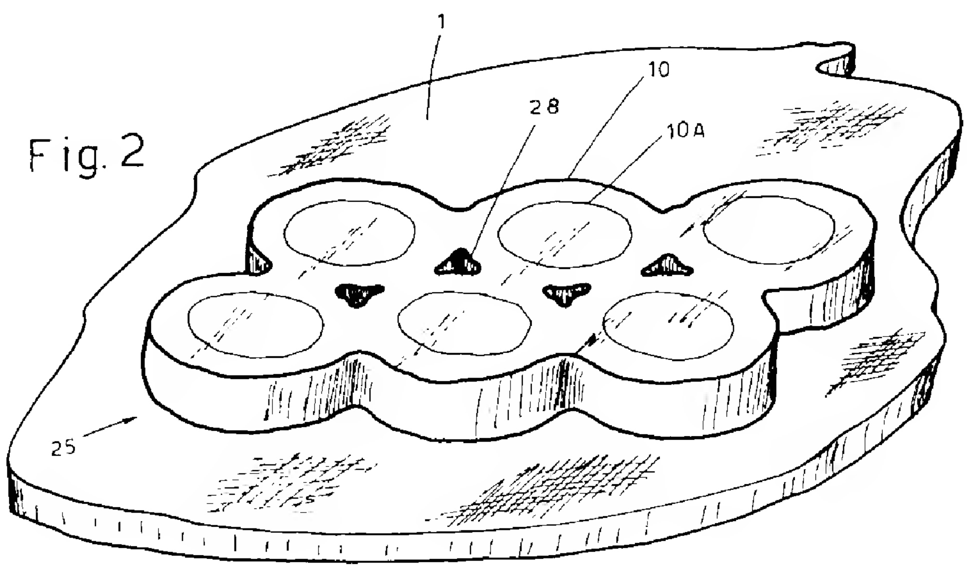


Fig. 2



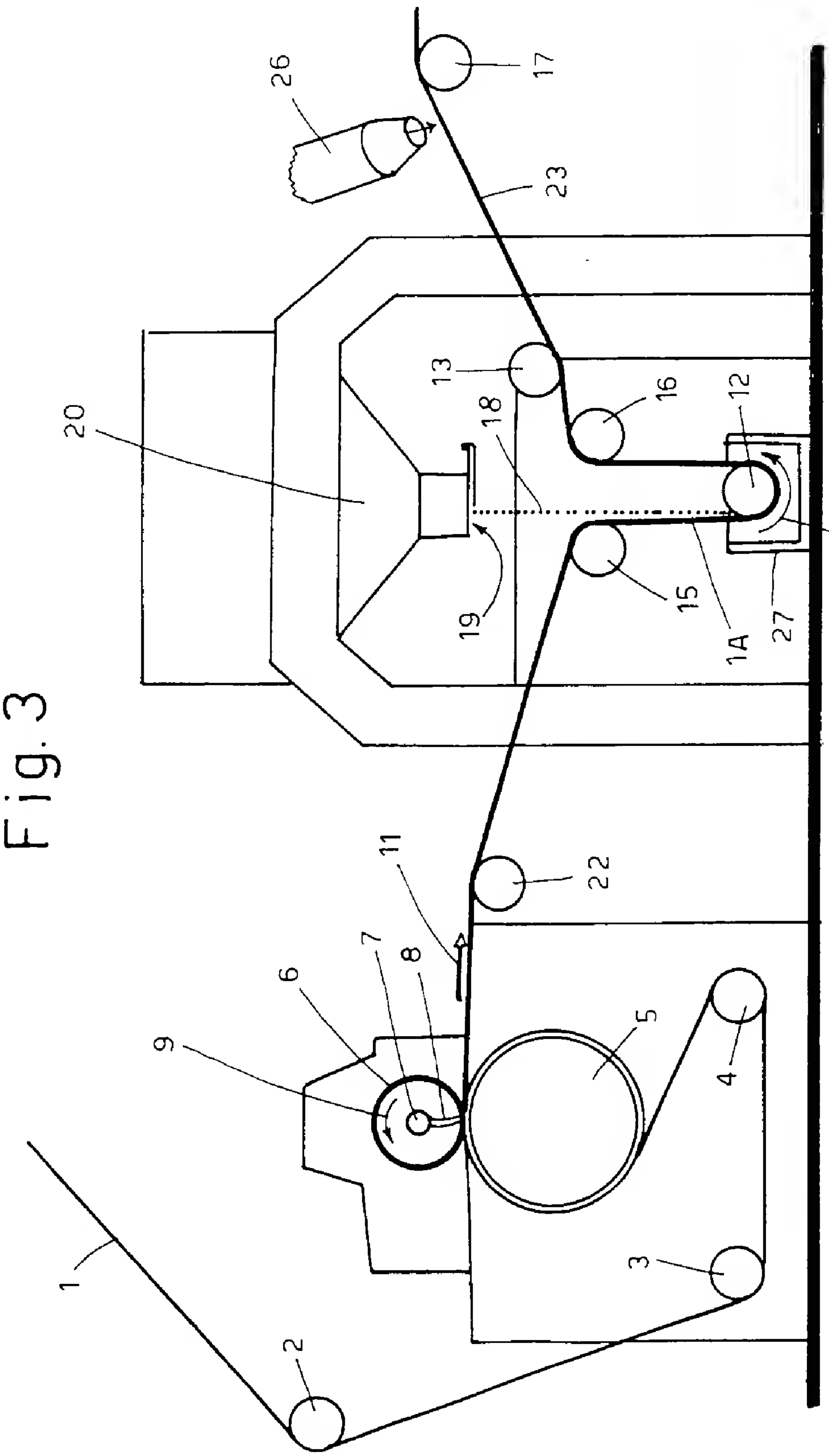


Fig. 3